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Nucleic acid-binding activities of the intermediate filament subunit proteins desmin and glial fibrillary acidic protein.

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Vorgias CE, Traub P.

In analogy to experimental results previously obtained with vimentin and neurofilament triplet proteins, the intermediate filament (IF) proteins desmin and glial fibrillary acidic protein (GFAP) were also found to have high capacities to associate with nucleic acids. Employing a collection of native and heat-denatured pro- and eukaryotic DNAs, a series of naturally occurring single-stranded (ss)RNAs and a variety of synthetic polynucleotides of the RNA and DNA type, both proteins could be shown to bind preferentially to single-stranded polynucleotides. In the case of ssDNA and synthetic polyribonucleotides, a clear dependency of the binding activity on the G-content of the nucleic acids was demonstrated. The interaction of desmin with ssDNA and tRNA was characterized by strong cooperativity. When a mixture of desmin and vimentin was offered to excess ssDNA, the cooperativity effect brought about segregation of both protein species into two distinct populations of deoxyribonucleoprotein particles with substantially different sedimentation rates; this segregation is in sharp contrast to the ability of desmin and vimentin to form heteropolymers in filament assembly. In general, desmin and GFAP were found to be similar to vimentin and neurofilament proteins in their nucleic acid-binding properties. However, there were also striking differences between individual non-epithelial IF proteins at this level.

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